ANSWER KEY.

Calculating Reaction Rate

Chemistry | ANSWER KEY

rate = Δ[ ] ÷ Δt in M/s. Δ = final − initial. Use −Δ[reactant] or +Δ[product] so the rate is always positive. Change minutes to seconds first.

1. [A] drops from 0.800 M to 0.560 M in 40.0 s. Find the average rate.

rate = −(0.560 − 0.800) ÷ 40.0 = 0.240 ÷ 40.0 = 6.00×10^{-3} M/s

2. [C] rises from 0.000 M to 0.120 M in 3.00 min. Find the average rate.

3.00 min × 60 s/min = 180. s

rate = 0.120 ÷ 180. = 6.67×10^{-4} M/s

3. Use the data for A → products. (a) Find the average rate from 0 to 20.0 s. (b) Find the average rate from 40.0 to 80.0 s. (c) Why is the second rate smaller?

Time (s)	**0**	**20.0**	**40.0**	**60.0**	**80.0**
[A] (M)	0.900	0.640	0.460	0.330	0.240

(a) −(0.640 − 0.900) ÷ 20.0 = 0.260 ÷ 20.0 = 0.0130 M/s

(b) −(0.240 − 0.460) ÷ 40.0 = 0.220 ÷ 40.0 = 5.50×10^{-3} M/s

(c) There are fewer A particles later, so there are fewer collisions per second. Rates are fastest at the start.

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4. $N_2 + 3H_2 \rightarrow 2NH_3$. NH_3 forms at 0.250 M/s. How fast is N_2 used? How fast is H_2 used?

N_2: 0.250 × (1/2) = 0.125 M/s
H_2: 0.250 × (3/2) = 0.375 M/s

5. $2NO + O_2 \rightarrow 2NO_2$. O_2 is used at 0.015 M/s. How fast is NO used? How fast does NO_2 form?

NO: 0.015 × (2/1) = 0.030 M/s
NO_2: 0.015 × (2/1) = 0.030 M/s

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6. A student finds the rate for [B] rising from 0.00 M to 0.45 M in 1.5 min and gets 0.30 M/s. What did the student do wrong? Find the correct rate.

The student divided by minutes. 1.5 min = 90. s, so rate = 0.45 ÷ 90. = 5.0×10^{-3} M/s.

7. A student writes the rate of a reactant as -4.0×10^{-3} M/s. Is a negative rate correct? Explain.

No. Rate is always positive. For a reactant, Δ[ ] is negative, so put a negative sign in front: $-\Delta$[reactant] ÷ Δt = $+4.0 \times 10^{-3}$ M/s.

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